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SYMPOSIUM NO. 4 OF WORKS OF THE ELECTRICAL ENGINEERING INSTITUTE,  
ACADEMY OF SCIENCES UKRAINIAN SSR

This symposium of works contains scientific articles which reflect basic trends in the work of the Electrical Engineering Institute of the Academy of Sciences Ukrainian SSR. The article by M. L. Lebedev, Active Member of the Academy of Sciences Ukrainian SSR and director of the Electrical Engineering Institute, L. M. Masnoshchik, Candidate of Technical Sciences, and Ye. A. Shkabara, Candidate of Technical Sciences, concerns problems in automatic electronic devices; the parameters of vacuum-tube computing elements are considered in these articles, and methods for selecting them are given.

Circuits and calculation techniques for dc amplifiers with feedback, used to perform operator functions, are considered in the article by L. N. Bashevskiy, Z. L. Mabinovich, and I. P. Shulova.

A number of the papers are given to problems of automatic process control and the theory of regulation. These works include (1) the article by A. G. Ivakhnenko, Candidate of Technical Sciences, in which regulation systems are investigated and conclusions and practical recommendations are given for the design of improved servo and regulation systems; (2) the article by Ye. A. Shkabara, Candidate of Technical Sciences, in which the author describes a thyatron drive with a wide range of regulation and high accuracy in maintaining the assigned speed; (3) the article by V. L. Lenin, Candidate of Technical Sciences, in which the necessary conditions are determined for maximum output of copper-oxide wattmeters used as measuring elements in an active-power regulator; and (4) the article by G. K. Rezhayev, Candidate of Technical Sciences, in which the author cites a calculation of the elements of a voltage regulator employing a thermistor.

In his article, A. K. Kotelnikov, Corresponding Member of the Academy of Sciences Ukrainian SSR, investigates the propagation of plane waves by using energy flow and density instead of vectors of the field.

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I. M. Sirota, Candidate of Technical Sciences, considers the problem of the calculation of magnetic fields caused by line currents when an iron mass surrounds the current-carrying conductor.

P. P. Ornatskiy, Candidate of Technical Sciences, notes the results of his work on the study of various electronic wattmeter systems and gives valuable practical conclusions on the application of these wattmeters.

The section "Systems and Devices Developed by the Institute, and Sample Calculations" includes an article by P. A. Katkov, Candidate of Technical Sciences, and another by A. G. Ivakhnenko and L. Ye. Fevraleva. Katkov describes a highly sensitive recording electronic frequency meter with a string vibrator, developed by the institute. Ivakhnenko and Fevraleva give an approximate calculation and results of laboratory tests of a magnetic repeater which can be used for remote transmission of wattmeter readings.

Brief abstracts, which in the original preceded each article, follow.

1. Electronic Computing Device, G. N. Izhakov, L. N. Lashevskiy, and M. A. Chkalova, pp 5-14

Considers electronic circuits of computing devices, which permit control from several existing circuits. Gives an analytical and graphical calculation of a computing device. Cites a method for selecting the elements of a computing device and determines the dependency of the bias voltage on the amplitude of the control signals. The results of the calculation have been checked experimentally.

2. DC Amplifiers for Continuous-Action Electronic Computing Devices, L. N. Lashevskiy, E. L. Kabanovskiy, and I. N. Chkalova, pp 14-26

Investigates circuits for using dc amplifiers with feedback to act as operators (i.e. differentiation and integration). Gives equations relating the output to the input parameters. Gives a method for analytical and graphical calculation of dc amplifiers with continuous stages.

3. Passage of Electromagnetic Energy Through a Boundary Plane, A. K. Kotelnikov, pp 1-10

An experimental study of the propagation of plane waves, using energy flow and density instead of field vectors. This method reduces the number of variables which must be used in wave propagation studies.

4. The Plane-Parallel Magnetic Field of Line Currents in the Presence of an Iron Mass, I. M. Sirota, pp 1-11

Investigates the plane-parallel magnetic field of a line current which is surrounded by an iron mass of arbitrary shape. Derives the equations determining its field by means of a conformal representation of the given regions (outer and inner boundaries of the iron mass) on the inner and outer regions of a unit circle. Various positions for one or several line currents relative to the iron mass are considered as particular cases of the general problem. Gives a sample calculation and results of an experimental check for the case of a single current placed in a square channel in iron.

5. A Thyatron Drive for a Unit Which Requires a Wide Range of Speed Regulation, Ye. A. Chvalova, pp 73-80

Describes a thyatron drive with a wide range of regulation and high accuracy in maintaining the assigned speed. This drive was developed and built in the Laboratory of Modeling and Regulation of the Electrical Engineering Institute. Results of tests on a commercial model are given.

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6. Study of the Quality of Processes in Stable Servo and Programming Regulation Systems by the Inverse Method, A. G. Ivakhnenko, pp 89-122

In a preceding paper, the author considered a device, called a flexible compounding coupling, for eliminating the kinematic lag of servo and programming systems. In this paper, he considers the effect of the transfer coefficient of the flexible compounding coupling on the quality of processes in systems of the second and third order. He discusses the problem of reducing the dynamic equation of the system to its simplest (dimensionless and normed) form, containing the fewest coefficients (parameters). A second-order system is, in the most general case, characterized by three parameters. Third- and fourth-order systems are also characterized by three parameters when the right side of the equation does not contain more than two terms.

Investigation of these cases in the general form becomes possible through simultaneous use of the roots of the characteristic equation (inverse method) and operator notation. Constructs planes of the important parameters which permit one to determine rapidly, without solving the dynamic equations, the indices of the process quality, i.e., the magnitude of kinematic lag, of the first dynamic deviation and of the duration of the regulation process.

7. A Voltage Regulator with a Thermistor, A. K. Kochayev, pp 122-129

Calculates the elements of a voltage regulator with a thermistor. In addition to static operating conditions, the author gives a calculation of the transient time in the regulator when the regulated voltage changes. This calculation gives a good indication of the dynamic properties of the regulator.

8. The Problem of the Maximum Efficiency of a Copper-Oxide Wattmeter, V. L. Emin, pp 129-141

Analytically determines expressions for calculating the errors of copper-oxide wattmeters with rectifiers having square-law and nonsquare-law volt-ampere characteristics. Determines the conditions for maximum efficiency of copper-oxide wattmeters of both types for a given accuracy of measurement.

9. Study of Various Electron-Tube Wattmeter Systems, I. I. Ornatkiy, pp 141-155

Reviews briefly known electron-tube wattmeter systems. Analyzes the operation of an electron-tube wattmeter, which is based on the use of the square-law sections of the vacuum-tube's grid characteristics. Analyzes errors caused by nonidentical tube characteristics and suggests method for eliminating these errors. Derives formulas for determining the errors due to the internal drain of the series and parallel circuits of the instrument and for determining frequency errors due to the presence of dividing capacitors and reactance in the circuits. Gives results of an experimental check of electron-tube wattmeters using diodes and mixer tubes. Points out advantages and defects of these wattmeters and indicates their fields of application.

10. A Highly Sensitive Recording Electronic Frequency Meter, E. A. Katkov, pp 155-160

Developed a highly sensitive recording electronic frequency meter with a polarized string vibrator. The instrument can be used to check the frequency of power systems in the narrow range around 50 cps.

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11. Approximate Calculation of a Magnetic Repeater for a Telemeter and a Magnetic Converter for a Measuring Compensator, L. G. Ivakhnenko and E. Ye. Fevrileva, pp 160-175

Proposes the use of a magnetic amplifier with heavy negative feedback (a magnetic repeater) for remote transmission of wattmeter readings. A magnetic converter was developed and built for converting low-voltage dc into ac. Gives approximate calculations, and cites results of laboratory tests of the magnetic repeater and converter.

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